Specification

Valve Spring Retainer Plate

The invention relates to a valve spring retainer plate for supporting the spring forces of closing springs acting upon gas exchange valves in connection with the valve operation of internal combustion engines, having a reinforcement member of a material of lower strength and an annular supporting member of a material with higher strength being positioned between the reinforcement member and the closing spring according to the preamble of claim 1.

Such a valve spring retainer plate for example is shown by German utility model DE 93 00 820 U1, in which the reinforcement member is made from a fiber-reinforced plastic and the supporting member of an annular steel sheet. The supporting member is integrated in the reinforcement member in a positive fit.

In a further valve spring retainer plate of the kind according to the above species (DE 41 20 892 A1) the reinforcement member for reducing the weight thereof is made of aluminum and the annular supporting member is made from a steel sheet, too. Here the supporting member is caulked with the reinforcement member.

It is the task of the present invention to propose a valve spring retainer plate of the above identified species which with an unchanged reliable function can be produced far more simply and therefore is suitable for a production in large numbers.

This task according to the invention is solved by the characterizing features of claim 1. Advantageous improvements of the invention can be learnt from the further claims.

According to the invention, it is proposed that the supporting member merely by the way of friction is maintained on the reinforcement member. It had been recognized according to the invention that it is sufficient for a reliable and possibly automated mounting of the valve spring retainer plate if the connection between the reinforcement member and the supporting member is by a frictional fit. As had been recognized, too, this frictional fit does not impede the reliable function of the valve operation in the later operation of the engine even with the occurring high valve accelerations. A lift-off of the supporting member from the reinforcing member is not occurring; relative movements around the valve axis, too, between the supporting member and the reinforcement member at least are negligible.

By the supporting disk in an advantageous manner additionally a radial support and a stiffening of the valve spring retainer plate is obtained. For example, thereby radial forces - starting out from the gas exchange valve - can be at least partly taken by or compensated by the supporting disk.

A sufficient frictional fit is obtained if the supporting member is maintained by means of an radially inwardly positioned annular section at a hub section of the reinforcement member. This results to an extremely simple premounting of the valve spring retainer plate by simply pushing both parts in an axial direction one over the other.

In this connection and especially with an automated premounting it is of advantage if the supporting member is maintained

at the reinforcement member with a slight pressure fit. This ensures a safe connection during the premounting and the later mounting even in connection with possibly critical transporting conditions.

With regard to the manufacture, the supporting member advantageously can have a L-shaped cross-section, wherein the radially inner annular section thereof is contacting the hub section of the reinforcement member with a slight pressure fit. This concept is especially of advantage during the manufacture of the supporting member from steel sheet according to the deep-drawing-method, wherein the inner annular section even with a merely slight pressure fit is leading to a reliable friction fit connection with the reinforcement member.

By a slightly conical shaping of the radially inner ring section with respect to the hub section of the reinforcement member (about 1 to 3 degrees) possibly occurring tolerances in manufacture can be compensated or a sufficient pressure fit at least at local points of the connection can be ensured.

Finally it is proposed to manufacture the reinforcement member from an aluminium alloy, e.g. an aluminium forging alloy, which apart from a reduction in weight and a good deformability is ensuring a sufficient strength of the valve spring retainer plate.

An exemplary embodiment according to the invention in further details is more closely described below.

The enclosed schematic drawing is showing a valve spring retainer plate for the valve system of an internal combustion engine having a reinforcement member and a supporting member

in a longitudinal cross-section along the central axis of the valve.

The rotationally symmetric valve spring retainer plate 10 shown is consisting of an annular reinforcement member 12 made of an aluminium alloy and an annular supporting member 14 made by a deep-drawing-method from steel sheet.

The valve spring retainer plate 10 in a valve system not shown is serving the operation of gas exchange valves in an internal combustion engine in a known manner as the connecting member between the lift valve and a closing spring, wherein the closing spring is supported on the radially extending annular section 14a. In the conical recess 12a of the reinforcement member 12, the valve wedges holding the valve stem are inserted in a mounted valve system.

The supporting ring 14 as shown is L-shaped in cross-section, wherein the radially inner axially extending ring section 14b is maintained on the exterior circumference of the hub section 12b in a friction fit or a slight pressure fit, respectively.

Possibly the above-mentioned ring section 14b can be made slightly conically with respect to the hub section 12b similar to the recess 12a to ensure a sufficient friction fit or pressure fit at least locally in connection with decreased manufacturing tolerances.

Different from the exemplary embodiment shown, the supporting ring 14 can be only made disk-shaped and then the interior recess enclosing the hub section 12b can contact the hub section 12b in a pressure fit.